

ROADWAY NOISE: FROM ANALYSIS TO MITIGATION RECOMMENDATIONS

Presented By:

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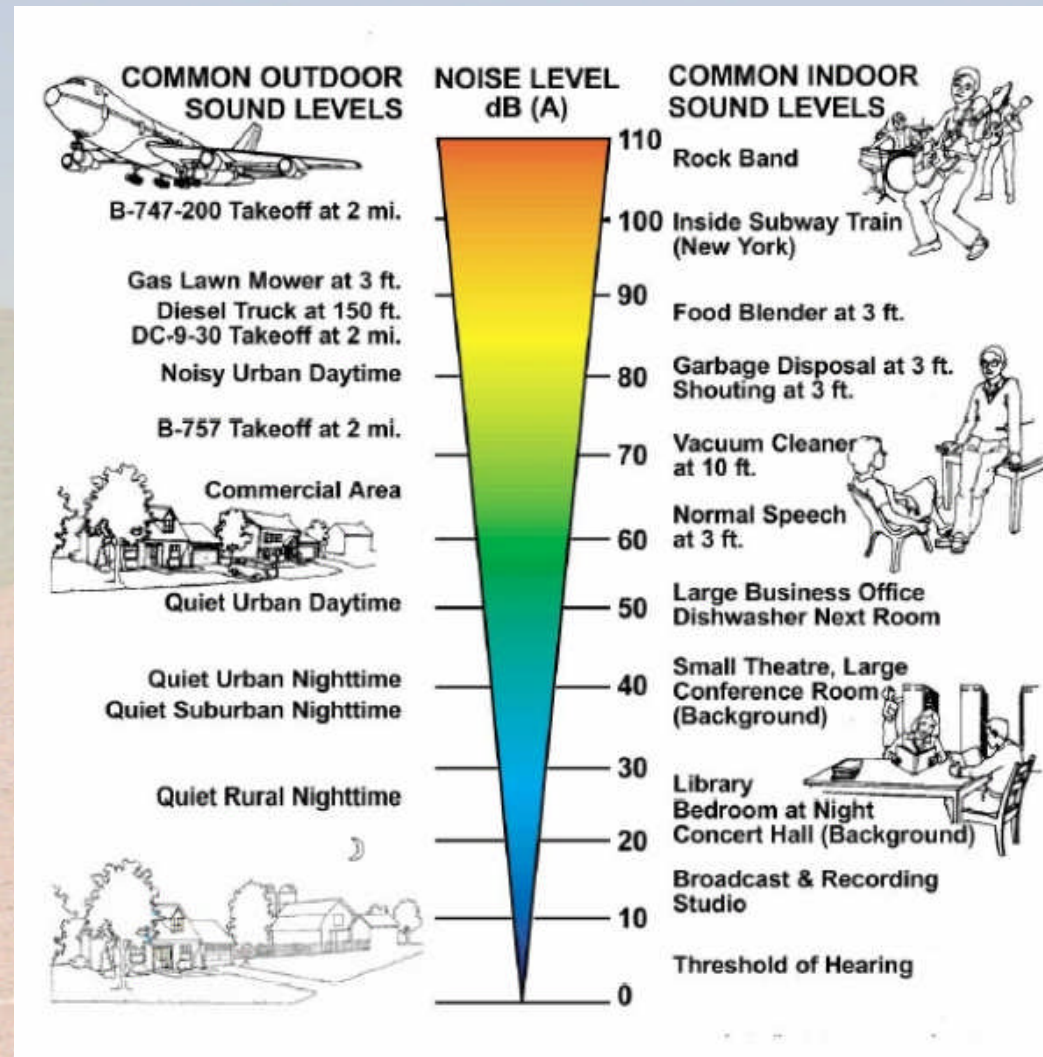
AZTEC Engineering



FUNDAMENTALS OF NOISE

- Defined as unwanted sound
- Measure unit is the Decibel (dB)
- Decibel is a logarithmic unit
 $50 \text{ dB} + 50 \text{ dB} = 53 \text{ dB}$ (not 100 dB)
- Noise is often measured in A-weighted scale (dBA) to closely represent the range of human hearing

Environmental Planning Group Brown Bag, November 2007



Human Perception of Changes in Sound Levels

- 2 to 3 dBA change is generally the smallest perceivable change
- 5 dBA change is readily perceived
- 10 dBA change is perceived as a double or halving of sound

ROADWAY NOISE Noise Measurement

- Sound level meter
- Measurement site selection
- Ambient condition

Roadway Noise Source Noise Generators -

- Automobiles
- Buses
- Medium & Heavy Trucks
- Motorcycles

Primary Factors Affecting Traffic Noise Levels

- Traffic Volume
- Traffic Speed
- Number of Trucks

Primary Factors Affecting Traffic Noise Levels

➤ Traffic Volume

2000 vehicles per hour is perceived as twice as loud as 200 vehicles per hour

Primary Factors Affecting Traffic Noise Levels

➤ Traffic Speed

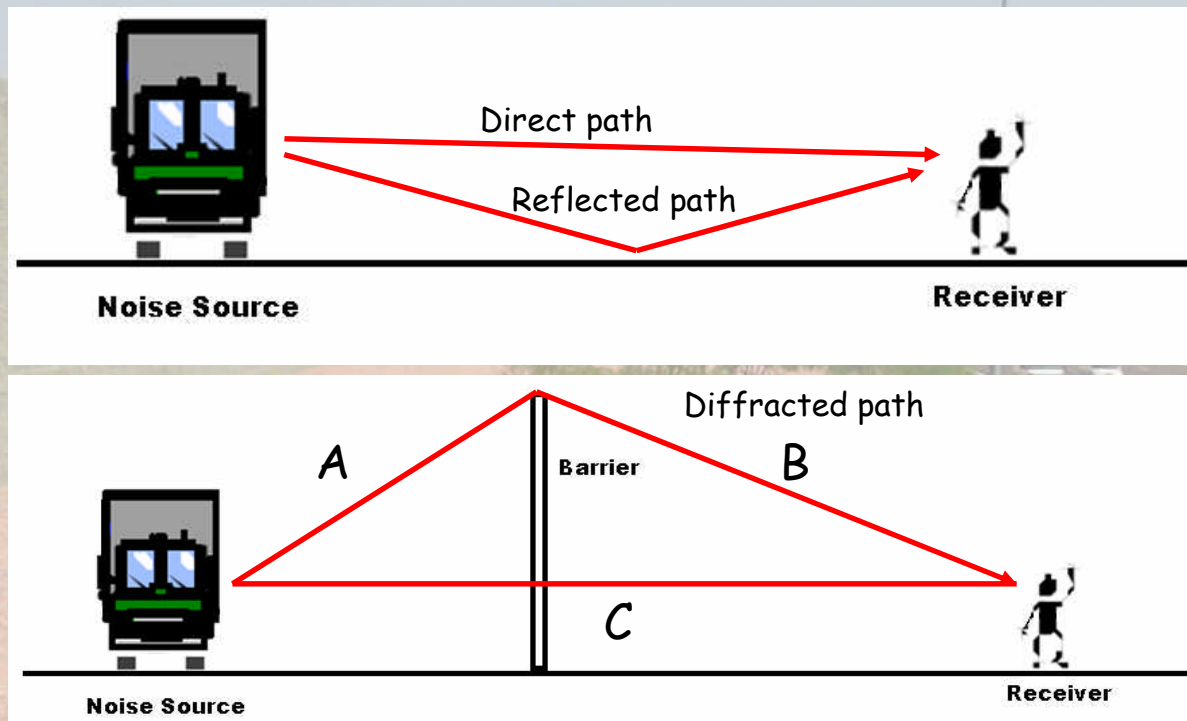
Traffic at 65 miles per hour is perceived as twice as loud as traffic at 30 miles per hour

Primary Factors Affecting Traffic Noise Levels

➤ Number of Trucks

A truck at 55 miles per hour sounds as loud as 13 cars at 55 miles per hour

Barrier Insertion Loss



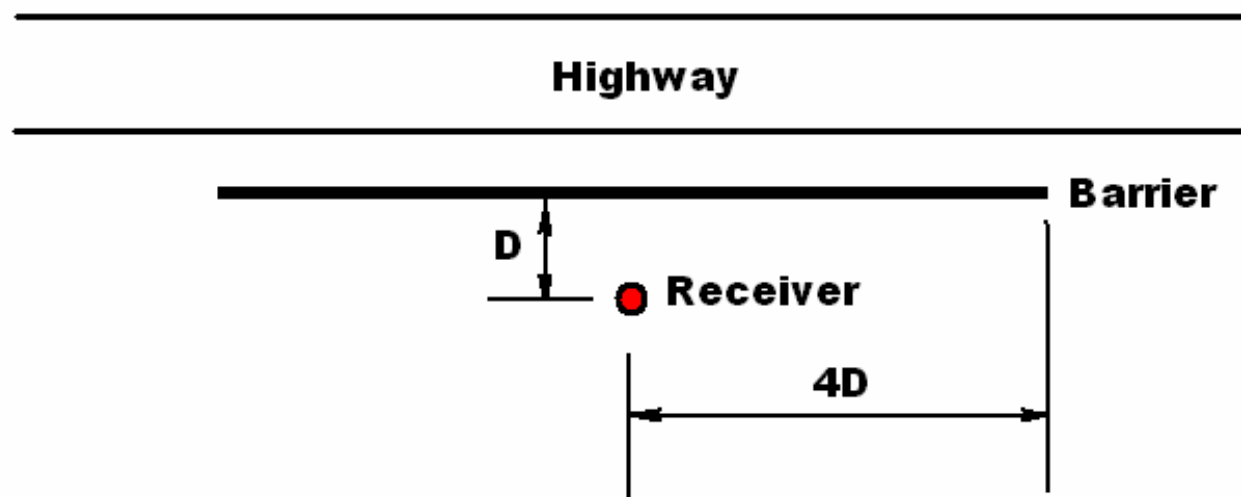
Unmitigated
70 dBA

Mitigated
63 dBA

Insertion Loss
= 7 dBA

- Barrier insertion loss
- Path length difference (PLD) = $A + B - C$

Noise Barrier Length



Use 4:1 ratio as a starting point, use modeling tools to refine the design

Noise Prediction Traffic Noise Model (TNM)

- Mapping and plans
- Analysis sections
- Receivers
- Barriers
- Roadways
- Ground type

Noise Prediction Traffic Noise Model (TNM)

➤ Mapping and plans

- Topographic base maps
- Aerial photographs
- Road profiles
- Traffic maps/data

Noise Prediction

Traffic Noise Model (TNM)

- Analysis sections
- Separate sides of the road
- Separate communities
- Natural or manmade boundaries
 - Traffic Interchanges
 - Non-noise sensitive or undeveloped land uses

Noise Prediction Traffic Noise Model (TNM)

➤ Receivers

- Where exterior human activity normally occurs
- First floor vs. upper floors
- Interior vs. exterior
- Proper height

Noise Prediction

Traffic Noise Model (TNM)

➤ Barriers

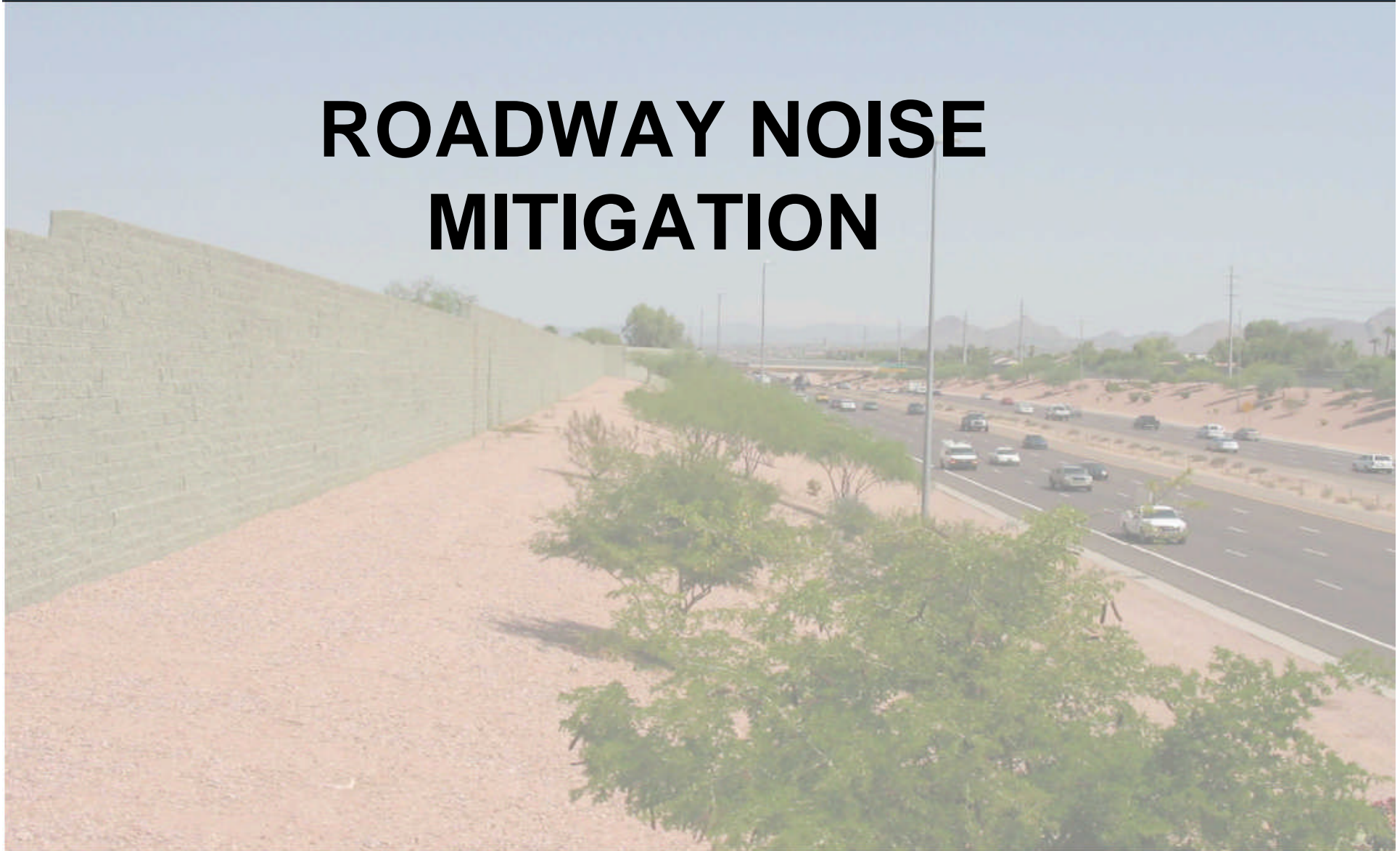
- At cut/fill transitions
- At regular intervals (100-200 ft)
- Base height: Typically 12-20 ft

Noise Prediction Traffic Noise Model (TNM)

➤ Roadways

- Group of lanes
- Roadway segments

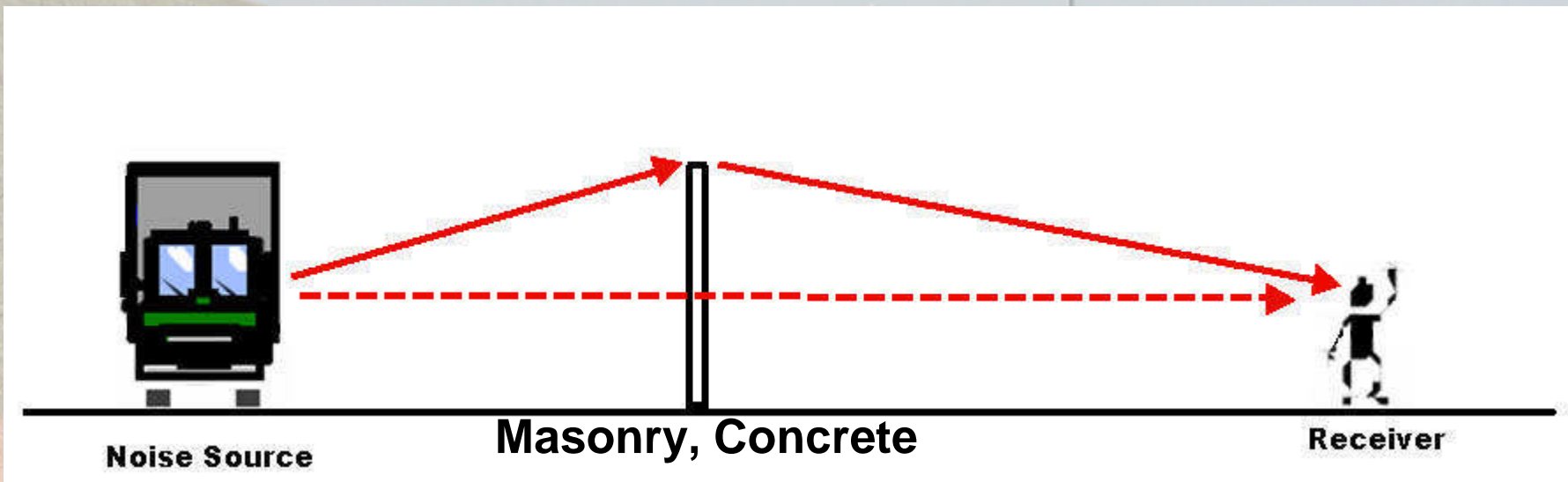
ROADWAY NOISE MITIGATION



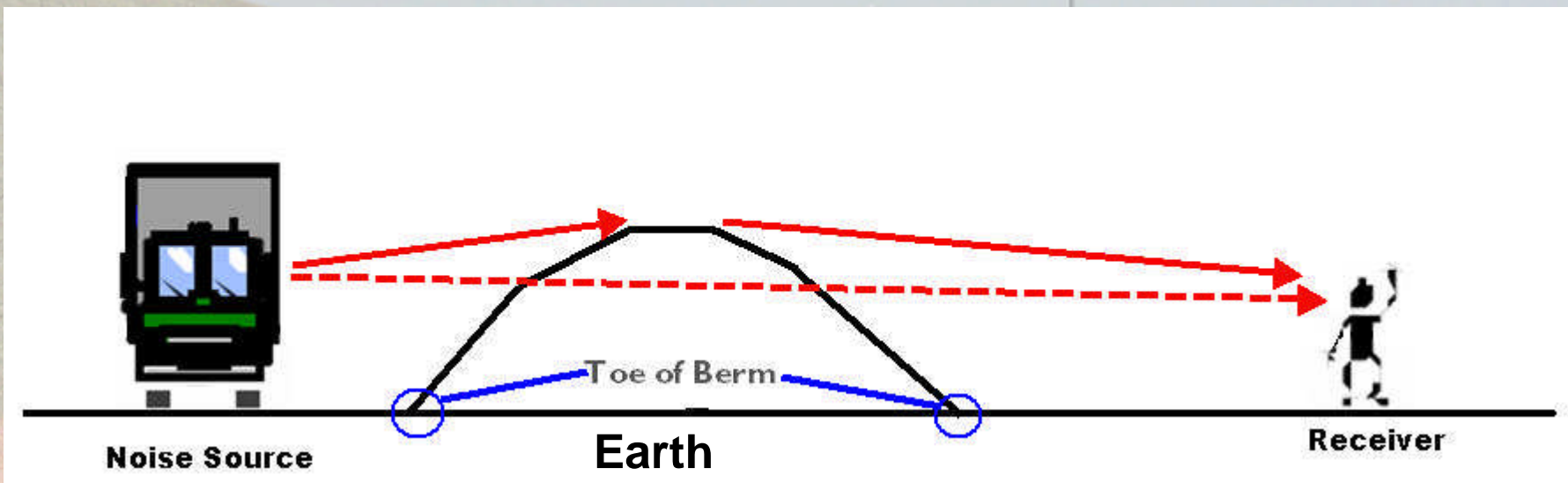
URBAN SCENARIOS

- **NOISE BARRIERS**
 - Soundwall
 - Berm
 - Soundwall/ Berm

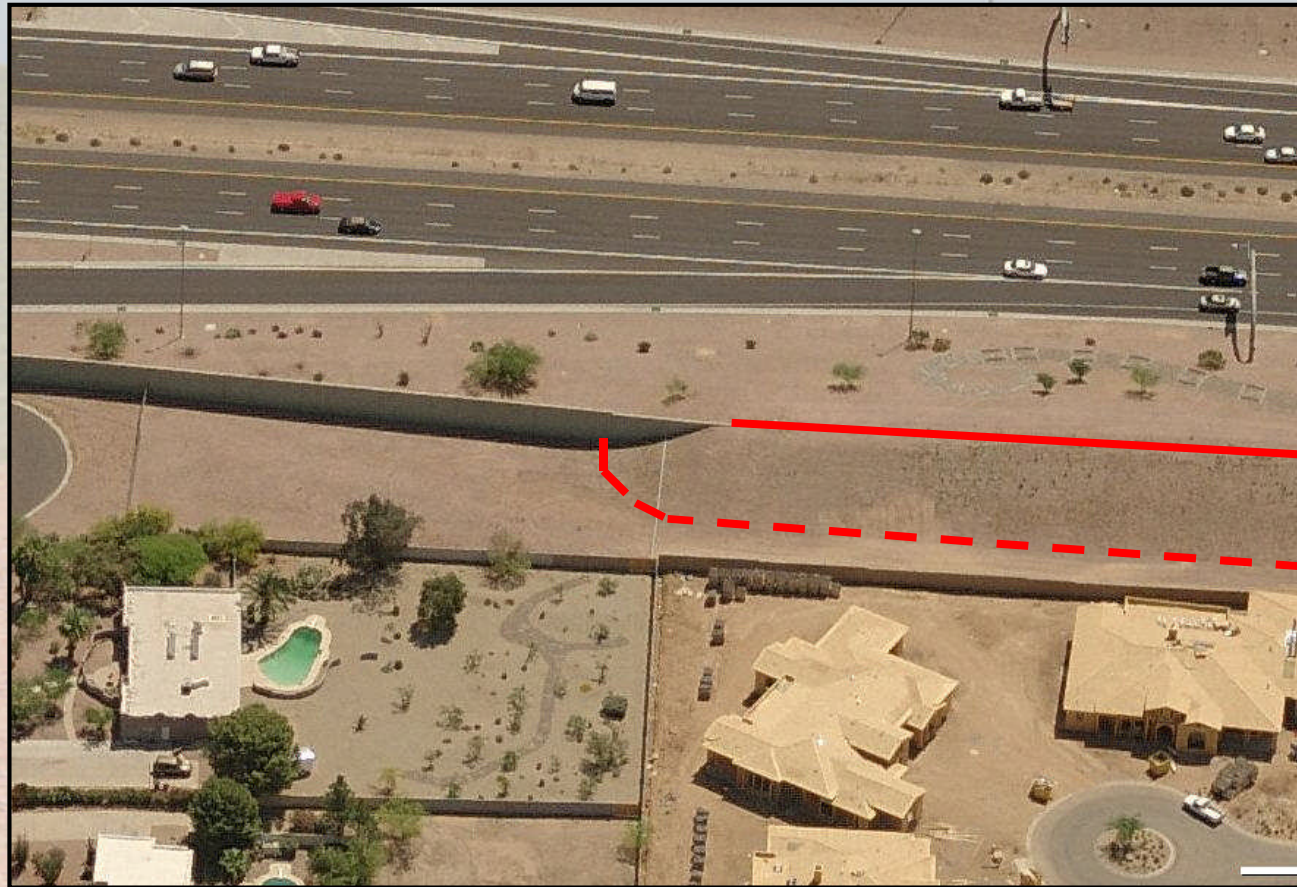
Soundwall



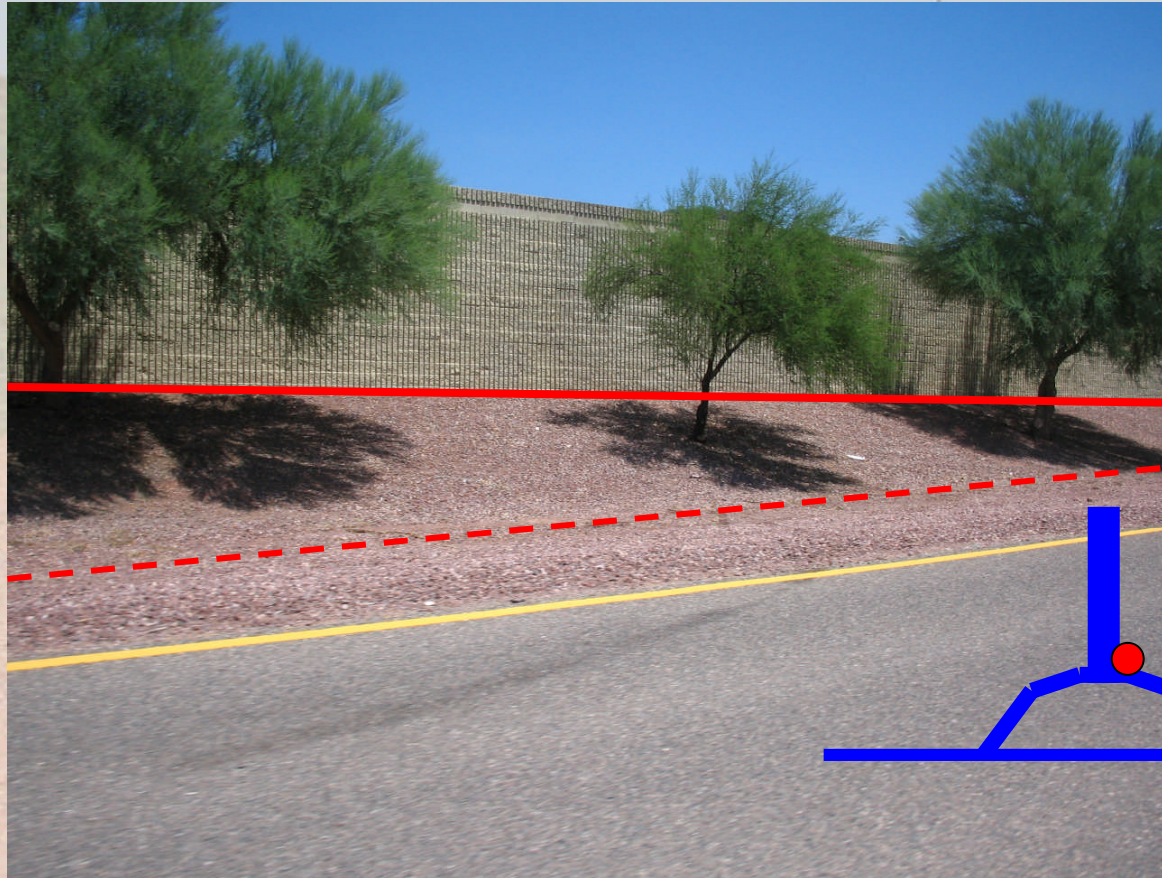
Berm



Soundwall & Berm



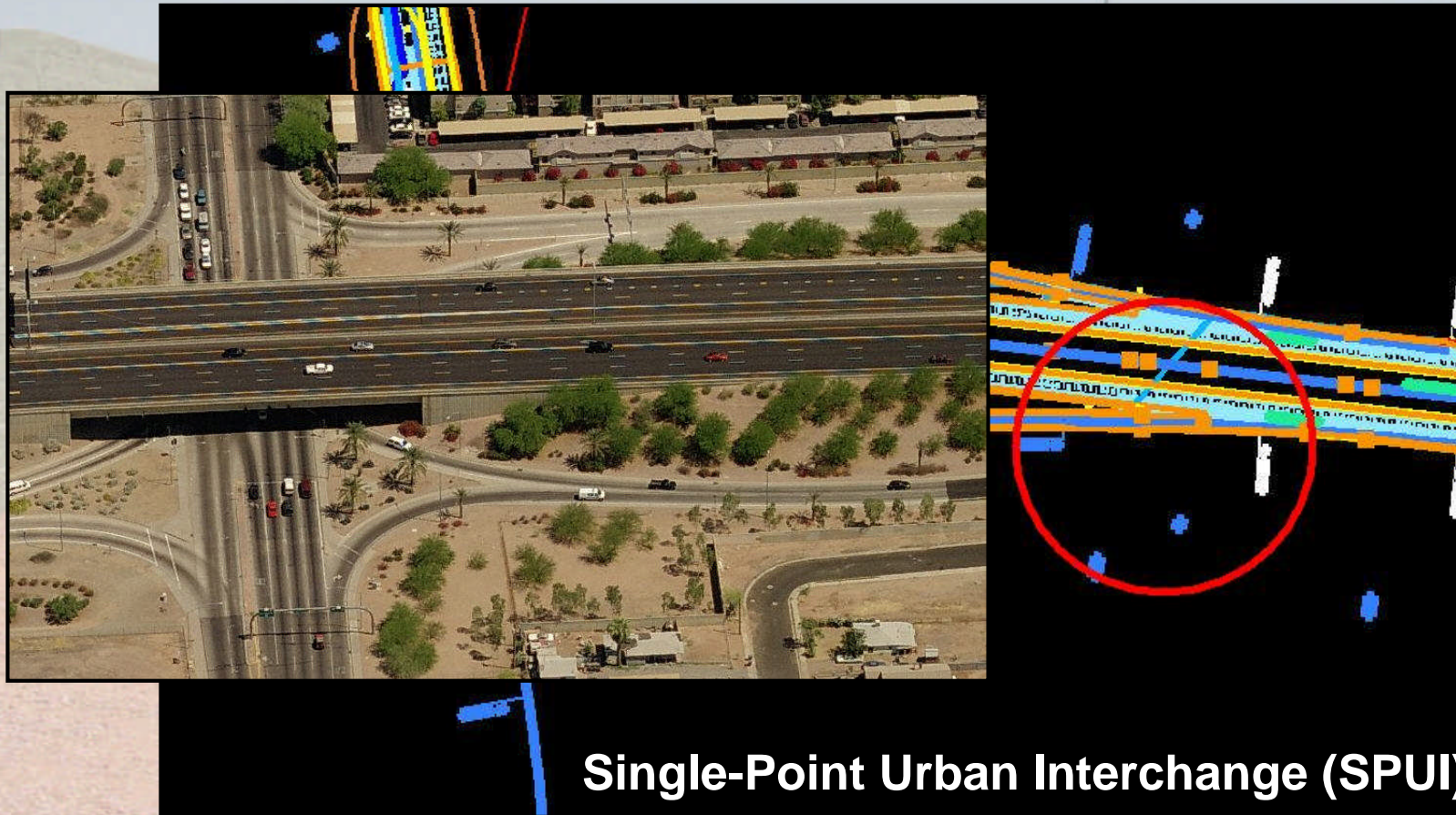
Soundwall on Berm



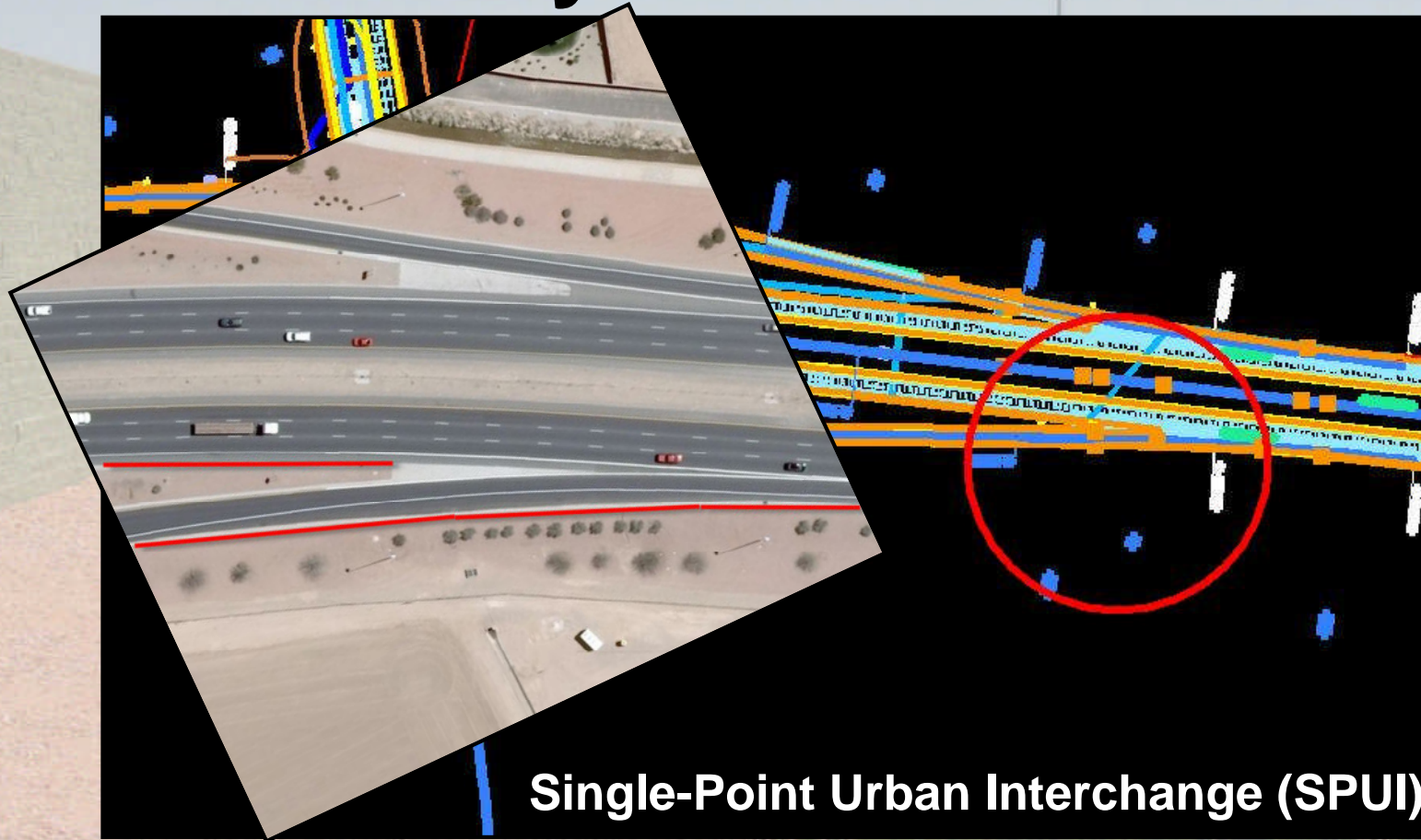
CONSTRUCTABILITY CONSIDERATIONS

- Geometrics
- Structure
- Drainage
- Utilities
- Safety

Roadway Geometrics



Roadway Geometrics



Single-Point Urban Interchange (SPUI)

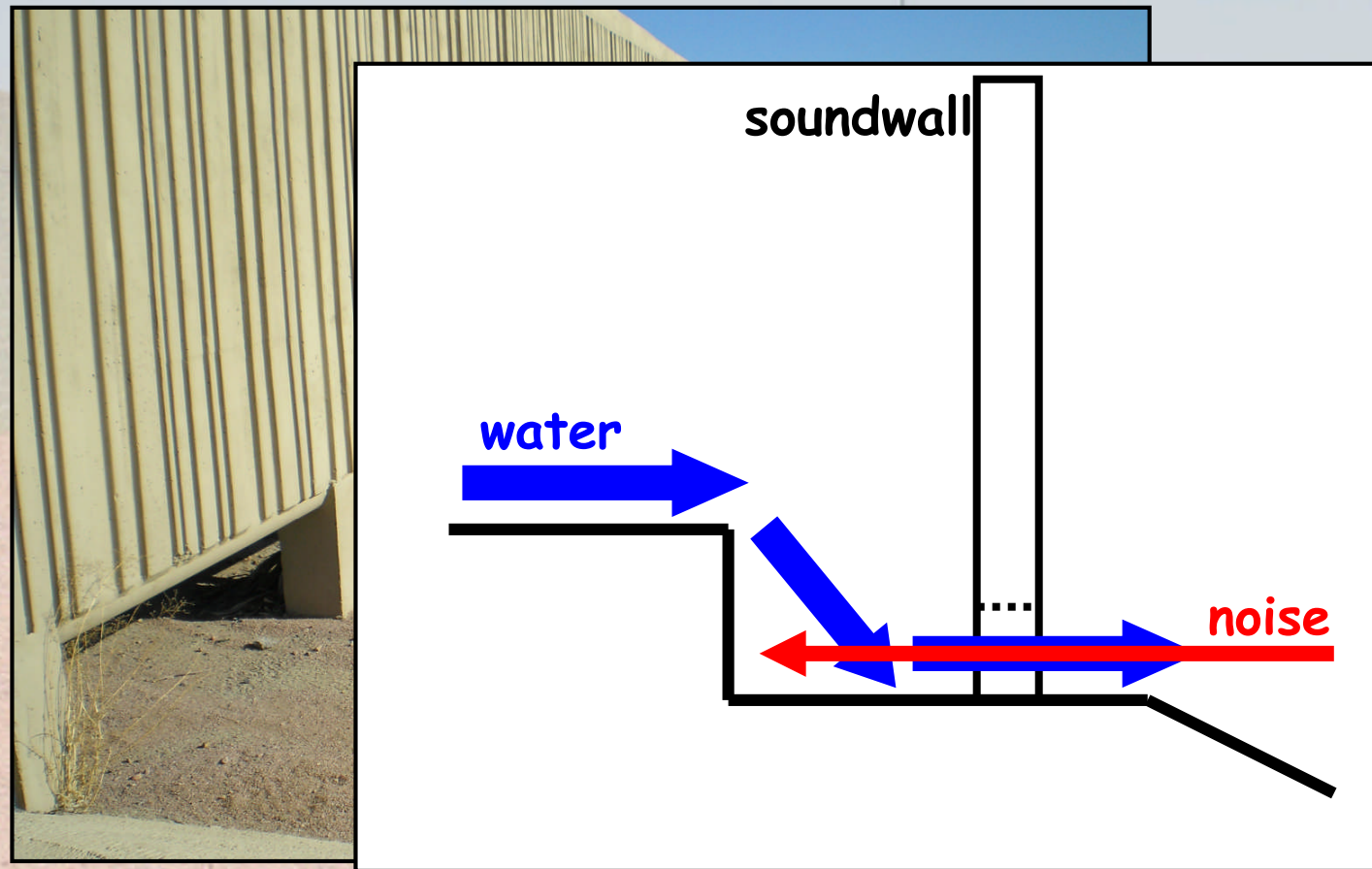
Structure



Drainage



Drainage

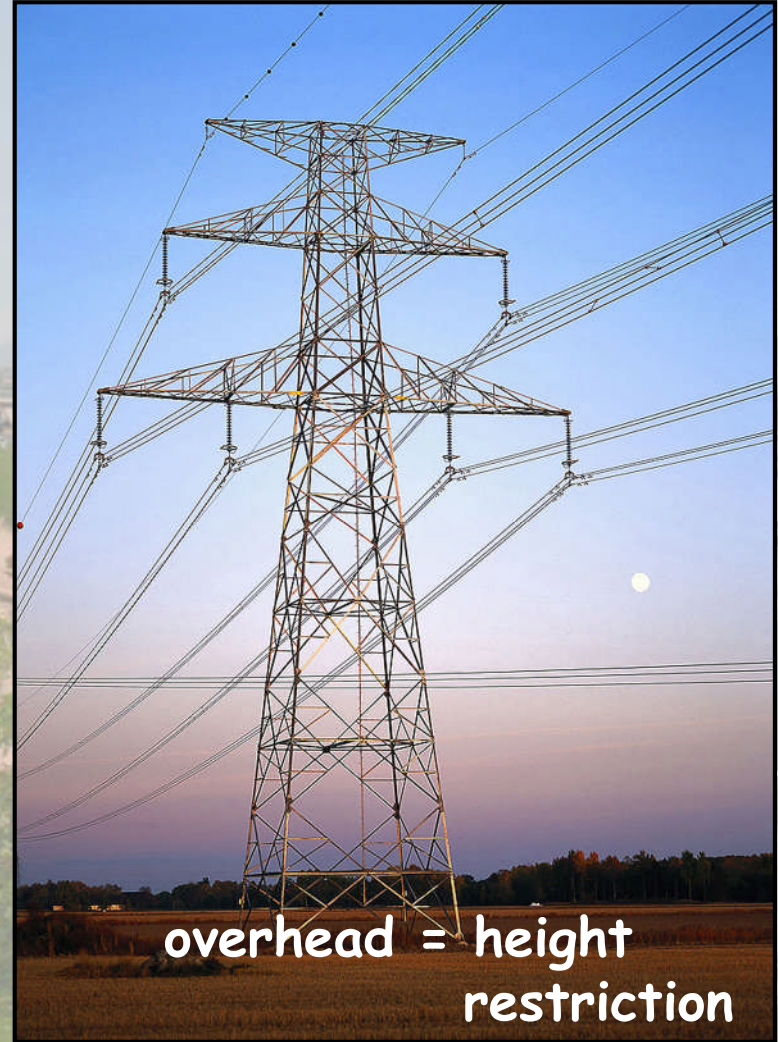


Utilities

underground = foundation



overhead = height
restriction



SAFETY



MITIGATION COST

- ADOT Noise Abatement Policy (NAP)
- Guidelines
 - FEASIBILITY



FEASIBILITY

- Amount of noise level reduction
- Barrier height/Line-of-sight check
- Breaks in barrier
- Other noise sources present
- Public consensus
- SAFETY

ADOT NAP

**ADOT ENVIRONMENT PLANNING GROUP
AIR & NOISE TEAM
FRED GARCIA • BARNEY REMINGTON**



THANK YOU

QUESTIONS?
COMMENTS?

